

# EARLY REPRODUCTIVE BEHAVIOR OF FLICKERS

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THE purpose of this paper is to record observations on the reproductive behavior of Yellow-shafted Flickers (*Colaptes auratus*) in the early breeding season, both in the field and in an indoor aviary. Some field observations were made at the Archbold Biological Station, Lake Placid, Florida, in February and April, and at Tamworth, New Hampshire, in May of 1958. Year-around observations on flickers have been made in Seneca and Bethesda, Maryland. I have spent approximately 500 hours a year for three years studying the comparative behavior of woodpeckers.

The early breeding season of flickers extends from the time of pair formation to the time of establishment of a nest hole just prior to egg-laying, a period which may last for three months. Bent (1939) and Burns (1900), among others, have described the general natural history of flickers. Descriptions are lacking, however, of tapping, duets of drumming, and even of the various methods of communication in relation to attendant circumstances.

## METHODS OF COMMUNICATION

Flickers communicate by dancing, by drumming, by varied vocalizations, and also by tapping, which, as described for Red-bellied Woodpeckers (*Centurus carolinus*), takes place in the early breeding season (Kilham, 1958). Methods of expression may be used with varying intensity and in assorted combinations, depending upon the situations involved. The following forms are distinguishable:

### *Vocalizations.*—

(a) High call.—A loud *kick, kick, kick* of great carrying power, which, at less intensity, sounds like *wick-a-wick-a-wick*.

(b) Dance calls.—The dances of flickers may be accompanied by *we-cup*'s or by soft *chewki*'s, the latter note appearing to be the more intimate one.

(c) Intimate notes.—Notes exchanged by mated flickers are numerous, particularly near the time of coition. Common varieties are *oi-eek, oi-eek*, and *werp, werp* or *what, what*, all of which suggest the low, conversational notes of Blue Jays (*Cyanocitta cristata*).

(d) Alarm call.—*Keogh*.

*Dance display.*—Flickers dance at full intensity by spreading and uptilting their tails to one side, thus displaying the yellow underside, by raising their red nuchal patches and, concomitantly, swinging and bowing their bodies from side to side as their bills jerk up and down in a W- or a figure-8-shaped course. Many forms of dancing are possible in a range between these extremes, and Noble (1936) has given further description.

*Drumming.*—The drumming of flickers is like a miniature pneumatic drill, for the individual blows come at a rapid, even rate from start to finish. Each burst lasts for about one second. Pauses between drummings may be anywhere from 10 to 40 seconds or longer, and male and female flickers may drum together, first one, then the other, in an alternating duet.

*Tapping.*—Flickers tap at a slow, countable rate of two to three taps per second and in bursts of two to 20 or more taps. There is usually a slight pause between bursts. One can learn to recognize tapping at a distance of several hundred yards. I have found no essential difference between the tapping of flickers and that of Red-bellied and Red-headed Woodpeckers (*Melanerpes erythrocephalus*) except that both sexes of the latter two species may tap simultaneously in what I have termed "mutual tapping" (Kilham, 1958 and 1959). Male and female flickers tap at separate times. Tapping for all of these species is associated, predominantly, with selection of a site for a nest hole.

*Wing noise.*—Flickers may make a *wurpp* noise with their wings when flying, even for a few feet. This noise is one of alarm and is not infrequently associated with the vocalization, *keogh*. Many species of woodpeckers can make ruffle noises with their wings, but the *wurpp* of flickers is unusual in being somewhat musical.

*Bill-touching.*—My hand-raised flickers occasionally touched or seized each other's bill-tips, often protruding their tongues at the same time. I have not observed bill-touching in the field. Althea Sherman (1910:142) stated that in years of close study of this species she had "never seen anything that suggested the feeding of one mate by the other," and doubted very much if this is done. One wonders, however, whether bill-touching may not represent the courtship feeding of other species. Flickers do not bring visible food, but pump or regurgitate into the open bill of the young one, which seizes the bill of its parent as Sherman has well described. Bill-touching may be symbolic of this manner of feeding. According to Tanner (1942), Ivory-billed Woodpeckers (*Campephilus principalis*) may touch bills in courtship, and Allen (1937:168) wrote that as a female climbed up a pine toward her mate "he bent his head downward and clasped bills with her."

#### FIELD OBSERVATIONS

The field observations given below have been selected from many others as contributing to an understanding of the flickers which bred in captivity. These observations fall under three headings:

*Pair formation.*—The displays and vocalizations of flickers may vary in intensity depending upon whether two of the same sex, or three birds representing both sexes are participating. The following observations were made in mid-winter, in a Florida pasture, before any search for a nest hole was evident.

(a) Dance of males.—A male flicker alit on a pine tree about 8:30 a.m. on February 2. He called *we-cup*, gave an abbreviated high call, then rested a moment before flying to the ground. A second male, equally unhurried, alit in the same grassy opening and the two flickers now faced each other, about four inches apart. About every 15 seconds they would point their bills into the air and wave them about for four or five seconds, exposing their throats and black moustaches in the process (Fig. 1). These odd dances went on in silence for six or seven minutes. The flickers then hopped along to a new opening among the saw-palmettoes (*Serenoa*) for another few minutes of the same performance. They kept wings and tails closed. Both birds finally flew into different trees, and the dances, which may have been between rivals for domination of one section of the pasture, ended without physical conflict.

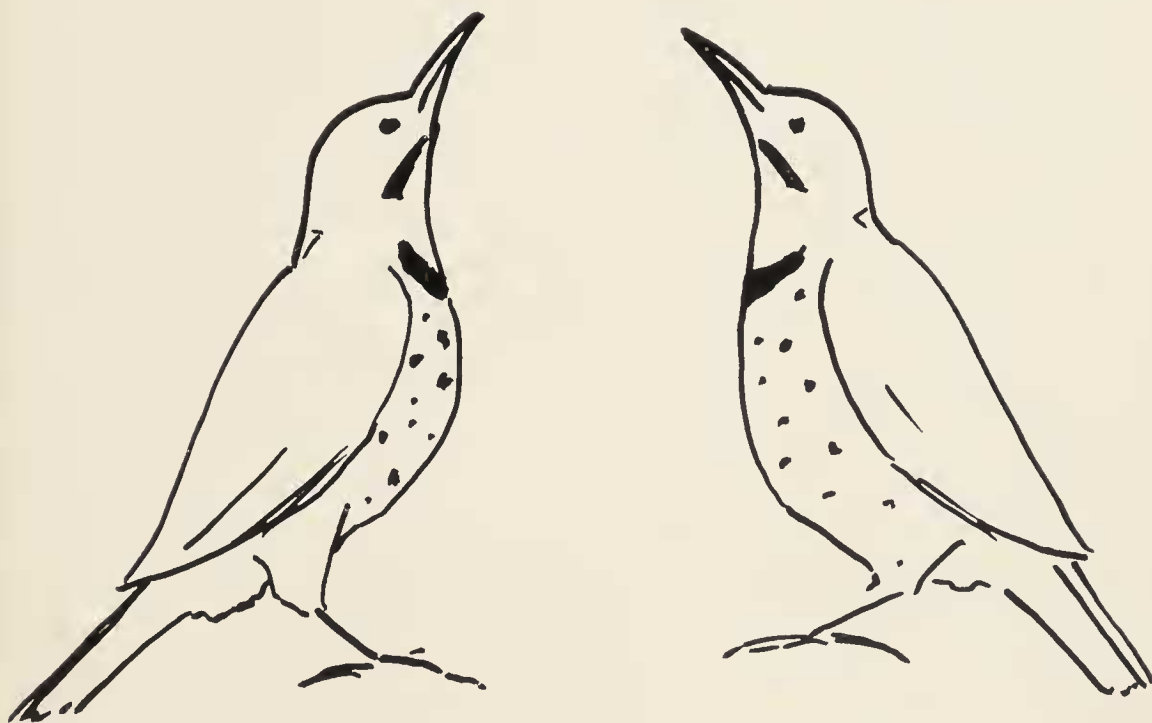


FIG. 1. Silent dance of two male flickers, Florida pasture, February 2, 1958.

(b) Dance of a male and two rival females.—Frost lay on the ground three days later when, at 7:30 a.m., I heard a medley of *we-cup*'s coming from the corner of the pasture where the males had displayed. There were now three flickers, a male and two females. They were all clinging to the trunk of a pine tree and would occasionally join in bursts of bill-waving to the accompaniment of low *we-cup*'s. The male was the least interested. He finally flew to a dead stub where he drummed and gave his high call. The two females quieted down as soon as he had left. Their vocalizations were now *chewki, chewki*, and their bill-waving became rather mild. They soon flew away. The trio reassembled shortly afterward on a dead pine limb where the male was perched on an elbow with the two females flanking him. Dances lasting four or five seconds alternated with periods of quiescence lasting 30 seconds. These dances were at full intensity. All three birds waved their bills, called a shrill *we-cup, we-cup*, raised their red crests and displayed much yellow by partly spreading their wings while fanning and uptilting their tails. The male tried to drum between dances. The females, however, gave him no respite, for they would

start a new dance which, to all appearances, he seemed compelled to join. Affairs continued in this fashion for five minutes. The tempo was gradually decreasing when one of the females suddenly flew at the male, driving him from his perch. This attack aroused excitement all around. The *we-cup*'s were again shrill, and one of the females drummed briefly. A second attack maintained the excitement. This time the aggressive female struck the male as if attempting to alight on his back and the two fell grappling to the ground. The male flicker then flew away. In his absence the two females reverted to a mild bill-waving accompanied by low *chewki*'s and *we-cup*'s. Variations of these performances went on for 1¼ hours.

*Search for a nest hole.*—

(a) Prolonged communication.—At mid-morning on April 30, a pair of flickers was on the dead pine where the trio had danced on February 5. Their activities over the next hour were as follows: The male was giving full dances. His mate kept bowing her head but was apparently less excited than he was, although both called *we-cup*. She departed on a long flight down the pasture fence. He remained on the dead pine, drumming about once a minute and giving occasional high calls. His mate, in spite of being 250 yards away, joined in with drummings and high calls of her own, as if communicating with him. He made two moves in her direction (Fig. 2) and continued his part of the duet. What looked like an impasse was broken when I chanced to see her returning, first to a pine 60 feet away, then to one adjacent to her mate. He stopped calling. There were no more vocalizations from either bird for 30 minutes, during which time he drummed alone until she broke a 20-minute silence by joining him in the drumming. The duet had no synchronization. Each individual gave a burst about once every 40 seconds. A man piling boards finally frightened the pair away. Events which took place two days later suggested that the long communication of the two flickers had involved possible sites for a nest hole.

(b) Agreement on the female's choice of nest hole.—On May 2 I heard tapping near the tree where the male had drummed in the long communication two days previously. I then spotted the male flicker as he tapped 12 bursts of eight to 12 taps each, just above a shallow, weathered excavation. His mate was on a limb above. When he left, she flew down and inspected the site. She did not tap. At 6:45 a.m., a half-hour later, I found the female calling once more from the pine stub down along the fence from which she had responded in the communication of two days before (Fig. 2). She now entered a hole in the stub, turned around and looked out for five minutes. Then she withdrew and tapped just inside the entrance, where I could see her bill as she gave two bursts of four taps each. The male had reached the entrance by the second burst, his crest raised and tail outspread as he made soft *chewki* notes. She slipped out, brushing past his neck. He now entered and appeared to tap inside. By the intensity with which he excavated the hole, already hollowed in some previous year, and by the coition described below, I presumed that this site had been finally agreed upon. He would appear at the entrance every so often to throw out a bill full of sawdust, sometimes repeating this performance ten or 15 times in succession.

(c) Removal of debris.—The male flicker emerged from the hole in the midst of his excavating with a half-inch piece of debris and, instead of dropping it out of the entrance as flickers may do with larger objects, flew off with it, holding his head high in an awkward fashion. He dropped the debris by an adjacent tree, then wiped his bill. A few minutes later he was again throwing out sawdust when he stopped to carry another piece of debris away from the hole. I had already observed the same phenomenon a number of times with the hand-raised male in the aviary. My conjecture was that, in both cases, a proper-sized object had stimulated the males to perform a piece of parental behavior, for

their awkward manner of flight suggested that of a male flicker leaving the nest with a fecal sack after feeding its young, a form of behavior which I had witnessed.

(d) Coition.—The male had been excavating for an hour when his mate returned, giving a soft *wrr, wrr* note as she alit at the entrance. She showed no interest in excavating on this or later visits. At 9:25 a.m. she had entered and was looking outward when her mate called *we-cup*, and shortly afterward gave a high call from a dead pine 80 feet away. She responded with a low *wick-a-wick*, then flew to him and crouched low on a limb where he mounted her in full coition.

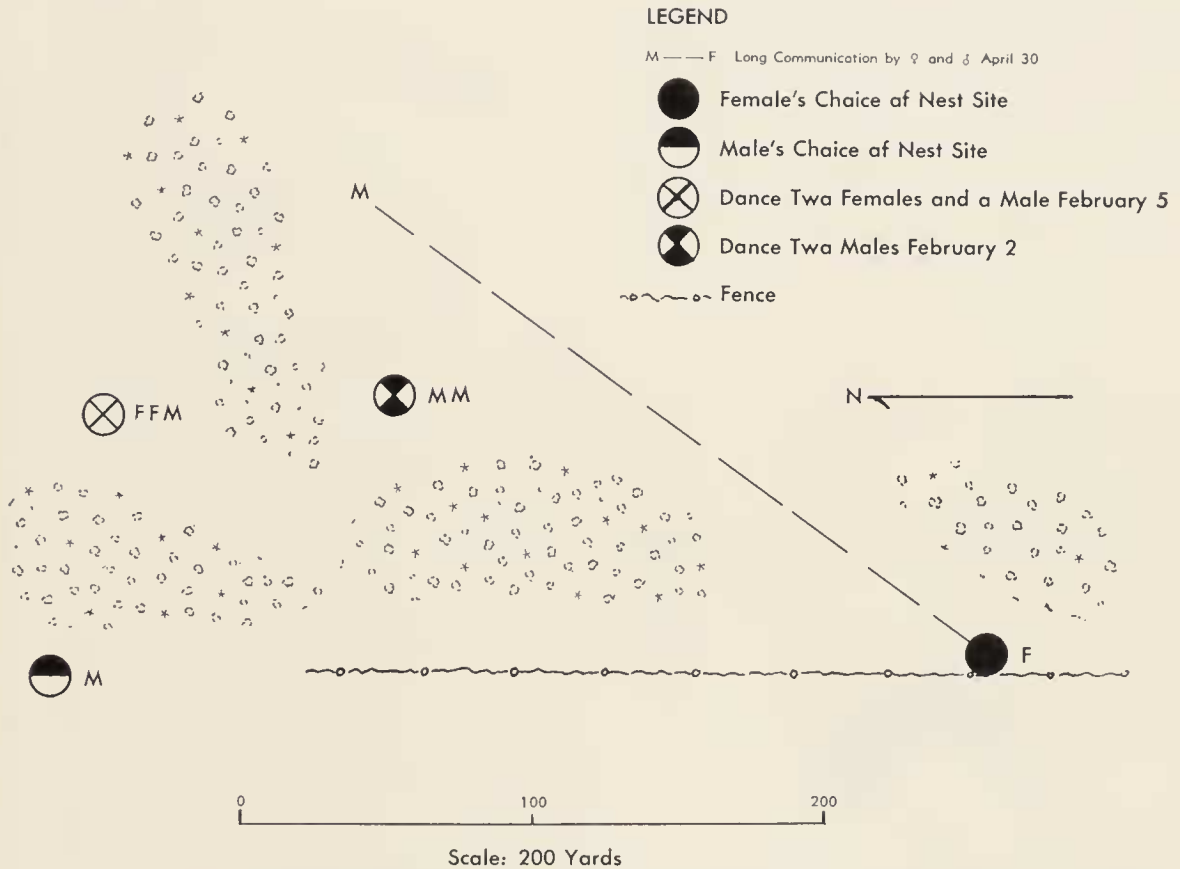


FIG. 2. The Florida pasture. Diagram of the events in the early breeding behavior of a pair of flickers, including conflicts associated with pair formation and a distance communication between the male and female over the site of a nest hole.

*Excavation and tapping.*—A pair of flickers was excavating a hole just below a limb, 50 feet up in a dead white pine in a woods at Tamworth, New Hampshire, May 18, 1958. I saw the female alight and tap seven or eight times, about six inches above the hole. Her mate flew over, danced on a limb below and gave *chewki* notes. This behavior was different from what I had observed among Red-bellied Woodpeckers, where the male almost invariably initiates the tapping and is frequently joined by his mate (Kilham, 1958). Since dawn is a particularly favorable time to observe the mutual tapping of these woodpeckers, I came on two mornings to see what the flickers might do at this time of day. Events on May 21 were representative. The male had gone to roost in his new excavation on the night of May 20, and he was looking out from the entrance when I approached at dawn. At 5:14 a.m. he emerged to give drummings and high calls from a neighboring dead

pine. He soon returned to rest by his excavation, and I then heard an abbreviated high call as the female approached. The male responded with a full high call. He now moved down to the hole, tapped three bursts of 15, eight, and two taps and then, when his mate alit on a limb above, joined her in a brief dance without vocalizations. I have never witnessed mutual tapping among flickers.

#### DEVELOPMENT OF BREEDING BEHAVIOR IN CAPTIVITY

Two nestling flickers, about three weeks of age, were removed from their nest hole in Bethesda, Maryland, on July 7, 1957, and kept in an indoor garage, modified into an aviary ten and a half feet square and seven and a half feet high. This pair mated and incubated five fertile eggs the following spring. It was apparent from field observations that the vocalizations and behavior of my hand-raised birds differed in no essential way from those of wild flickers observed in Florida, Maryland, and New Hampshire. One presumes that much of flicker behavior is either innate or is learned prior to leaving the nest.

The two young flickers carried on some phases of breeding behavior in a fragmentary way, but with increasing skill, from the time they were nestlings. Their activities may be outlined as follows:

*Juvenile development.*—The two fledglings might have left their nest naturally on July 11. On this day the female waved head and body, called *we-cup*, then seized her brother's bill in her own. I witnessed no further bill-touching (Fig. 3A) until December. The flickers were comparatively quiet during July and August but, when approaching each other, they might dance like mechanical puppets and call *we-cup*. They did little drumming in August and the male gave his first high call at the end of the month. A post-juvinal molt was now underway. The female had lost her black moustache by September 9, and both birds had bright yellow under their wings and tails. Their reactions to each other became of increasing interest.

*Association and dominance.*—The male gave occasional high calls during fall months and usually danced and called *chewki* when coming near the female, whose behavior remained subdued. Both flickers drummed. The bursts might start in a slow way before reaching the pneumatic intensity which became habitual later on. It was evident that the two birds liked to be together, for if he flew to the ground, she might follow and both would toss leaves and soil about with a vigorous prying motion of their bills, within a few inches of each other. His dominance was particularly manifest at feeding places. If he found a good spot, he would give a *we-cup* dance as she approached and she would leave, but if she turned up something of interest, such as an earthworm, he might displace her quietly. This situation continued through the breeding season. There were occasions, however, when the female might display vigorously, and one was when I used a hose to water the earth,

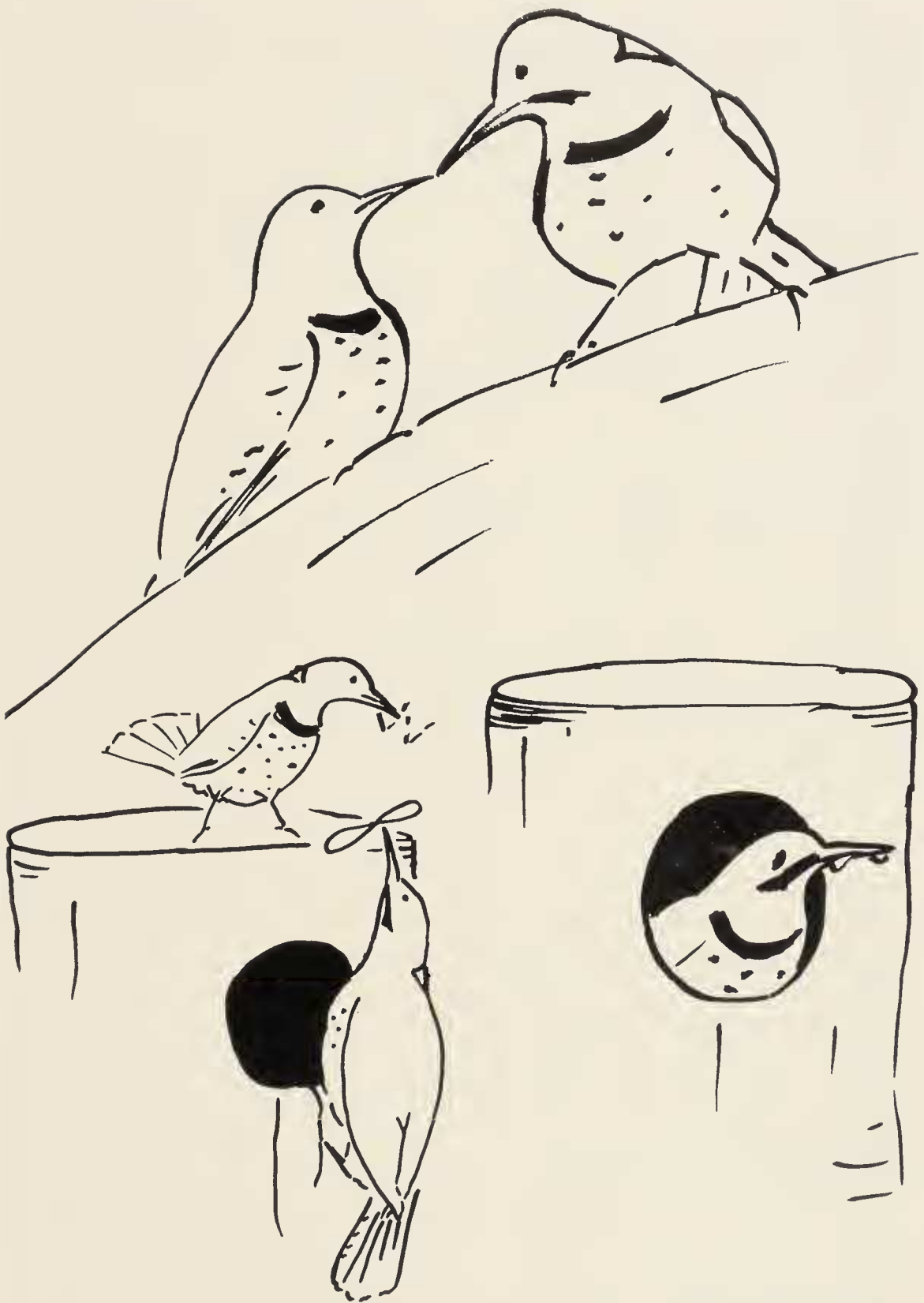


FIG. 3. Some events characterizing the early reproductive behavior of flickers. (A, above) Bill-touching. (B, left) Male at entrance to nest box "swells" upward toward mate who is doing a *chewki* dance on roof. (C, right) Male removing large piece of debris from nest box.

logs and plants in the aviary. The male was much alarmed by this procedure. On September 18 and October 16, he ran about the bottom of the aviary in a furtive manner for some hours, during which time the female assumed a dominant behavior, dancing at full intensity and calling *we-cup*. She appeared stimulated by his submissiveness. This fortuitous experiment suggested that the male's usual activity in dances and vocalizations was a means of maintaining dominance. When he stopped, she assumed the role. The normal male dominance appeared to be important to subsequent breeding, for such problems as which bird should spend the night in the nest hole were solved automatically by the male taking over.

*Pair formation.*—Wild flickers, observed during the autumn in a swamp near Seneca, Maryland, behaved much like my captive flickers in displaying fragments of breeding behavior. The swamp flickers were migrants. When winter weather led to a cessation of their incipient breeding activities, my captive birds, living indoors, continued to develop. I suspected that something approaching actual pair formation took place in early December. The female became more assertive and this seemed to stimulate the male. On December 10, for example, she was taking much of the initiative, and after a *chewki* dance at full intensity, the two birds seized each other's bills. The female then drummed. She had done little drumming in previous months. The male drummed regularly on an upright ash log, and on January 2 his mate settled two feet below him for an alternating duet. They had many such duets in following months.

#### PHASES OF BREEDING BEHAVIOR

New types of behavior appeared when I placed a nest box in the aviary on March 9. The male kept putting head and shoulders inside to inspect the hole and did the first tapping which we had seen. He continued to tap above the entrance almost daily. The female did not start tapping until March 21, but three days later she gave 50 taps in three consecutive bursts. High calls and dances indicated increasing excitement. I realized by March 25, however, that the nest box was too small, and I replaced it with a larger one. The first egg was laid on May 23. Two cycles were to reach a crescendo, then collapse, before I realized that (1) the box had to be on a pole away from the wall and (2) an aggressive male sapsucker, also paired and trying to breed, had to be removed. Field observations suggested that such phases are not unnatural. Woodpeckers may experience various difficulties and defeats before finding a suitable nest hole, as I have described for one pair of Red-bellied Woodpeckers (Kilham, 1958). There was an interplay of interest between the two flickers. The male would have the greatest interest at the start of a cycle and periods of intense excitement might follow as he roused his mate to an



enthusiasm for the potential nest hole. Her interest would finally collapse in abortive cycles, to his obvious distress. I would then re-locate the nest box. The flickers went on to repeated coition and egg-laying when my last efforts produced a suitable arrangement. The activities involved in a typical cycle may be outlined as follows:

*Efforts of male to win female to nest box.*—

(a) Entry to box.—The male went completely inside the new nest box from the day it was installed, but the female, for some days, did no more than cling to the entrance and look in. Either bird might hang from the entrance by one foot to sound the outside of the cavity with a few pecks or explore it with its long tongue.

(b) Tapping.—While both sexes tapped above the entrance on the first day, the male did most of the early tapping and was the first to tap from the inside. On April 14, for example, he tapped three bursts of 14, 20, and three taps, respectively, on the outside. He later tapped ten bursts on the inside. One could see his head moving just within the entrance and I counted 33 taps in one of the bursts.

(c) Response of female to tapping of male.—The more common responses of the female to the tapping of her mate were (1) to drum or (2) to give a high call. (3) She sometimes answered with soft notes such as *what, what* and (4) she might fly to the roof for a *chewki* dance while the male was below at the entrance (Fig. 3B). (5) Finally, the female might fly to the entrance when he had tapped from the inside and the two would face each other, he sinking low while her head was high.

(d) Female follows male.—She would follow male persistently, soon joining him wherever he might alight, and often initiating dancing.

(e) Other activities.—Duets of drumming, occasional bill-touching and shrill *we-cup*'s continued in a random fashion. The loud, persistent high calls of male flickers are one of their best-known activities in nature. My captive birds gave relatively few high calls. By one interpretation, the caged birds were already paired and the male had, in consequence, no need to call up a mate.

*Rising acquiescence of female.*—Two weeks after I had installed a new nest box activities became very intense. The female started performing much of what her mate had been doing and he started new forms of behavior.

(a) Male and female in box together.—The female now began to enter the box for the first time and soon both flickers went into the nest together. She usually came out first. If she happened to be inside and he looked in, she might squeeze out past his neck.

(b) Male removes sawdust from box.—When the female started taking a greater interest, her mate began removing some of the sawdust which I had placed in the bottom of the box. Instead of tossing it out of the entrance as excavating flickers usually do (*vide supra*) he might carry up to five billfuls across the aviary and deposit them (Fig. 3C). His manner of holding his head high was suggestive of a parent flicker flying off with a fecal sack. Since the nest box was fully excavated to begin with, sawdust removal appeared to be a ceremony or rehearsal of events to come.

(c) Tapping.—The female began to tap more on the outside of the box, and the male to tap at the bottom of it, so that we could no longer see his head moving.

(d) Male seizes female.—When the two flickers were in the box together, the male might seize his mate as she started to wriggle out. One could see small feathers clinging to his bill afterward and I noticed an increasing number of them about the aviary.

(e) Swelling upward at entrance.—If the male tapped while at the outside of the hole, the female might alight on the roof and bend downward in a *chewki* dance. The male

would raise his red nuchal patch, then swell upward toward her without moving his feet from the lower rim of the hole. At a later time, when she had begun tapping more frequently, she would swell upward toward him in similar fashion or, if he only came near the box, she might swell sideways with her breast toward him.

(f) Female swoops on male.—When the male was at the entrance or was feeding on the ground, his mate might swoop down in flight as if to peck him.

(g) Soft notes by female.—The female made an increasing number of soft notes, such as, *what, what* and *oi-eek, oieek* as the activities of the pair were becoming increasingly quiet.

(h) Male seeks coition.—The male would come along beside the female in a manner not observed previously. He behaved as if trying to mount, but she would move away.

(i) Other activities.—There was occasional bill-touching and a decline of drumming in the late part of the cycle.

*Collapse of female interest.*—The female lost interest toward the end of each of the first three cycles of breeding behavior which took place between March 9 and May 4. The male reversed roles and pursued her when she no longer came to the box. A fourth and successful cycle began on May 4.

*Full acceptance of nest hole by female.*—As indicated by the behavior described below, the female quickly accepted the nest box when I hung it on a pole and removed the male sapsucker from the aviary.

(a) Extensive tapping by female.—On May 5, in the final cycle, the female tapped ten bursts of six to eight taps each when she was inside the nest box. Her head was just showing. She later tapped out of sight at the bottom of the box in the manner of her mate's earlier behavior.

(b) Female by box more than male.—She spent increasing amounts of time clinging to the entrance hole or quietly disappearing inside. Her mate might look in briefly, then leave.

(c) Female invites coition.—The pair was often on the ground feeding when she would fly up making soft *oik*'s to crouch on a limb by the window. He would follow immediately. Full coition took place on some occasions and pseudo-coition at others. In full coition, the male would fly to the female when she had assumed the inviting pose, mount her back, then take time to get well established. He would peck down at her bill, meanwhile falling off to her left side and somewhat backward as cloacal contact took place. We might observe coitions three or four times a day, but they were undoubtedly more frequent. They might take place at any hour. The final breeding phase began on May 4, coition was first observed on May 7, the first egg was laid on May 23, and full coition was last observed on May 27. A fifth egg was laid on May 29.

(d) Female attacks male.—The aggressiveness of the female came as a marked change from her earlier subdued manner. When she was in the box, she might draw back and strike at her mate when he came to the entrance. She also did this at a later time when brooding eggs.

(e) Increasing quiet.—There were few noises compared with previous weeks. Drumming and high calls were infrequent, but the pair did exchange soft, low notes.

*Laying and incubation of eggs.*—It was evident when the female had laid her first egg, for she filled the whole entrance by puffing out her breast feathers and drawing her head back as if ready to strike. She struck at my hand savagely when in the same pose four days later. This was unusual boldness, for she had always been shy.

(a) Eating of eggshell.—When a hen's eggshell was placed in the aviary on May 27,

the male immediately explored the fragments with his tongue and left. His mate then flew down and devoured the pieces eagerly.

(b) Nest relief and tapping.—The female came to the entrance, making soft notes, at 7 a.m. on May 27. Her mate tapped briefly from the bottom of the nest, then slipped out of the entrance. She entered thereafter. A similar episode took place on the following day, only he remained where he was.

(c) Male spends night in nest hole.—The male did not spend any nights within holes from the time I first got him in July until May 29 of the next year when the last egg had been laid. He then spent every night in the hole until June 5.

*Final collapse.*—I finally decided not to attempt any full nesting of the flickers, since we were about to go on leave, and early breeding behavior had been the principle object of the study. The female flicker lost all interest in incubation when I re-introduced the male sapsucker. Her mate persisted longer but was much disturbed at not being relieved at the nest, and the two dramatic events which took place possibly resulted from his frustration.

(a) Savage attack by male.—The female was attacked by the sapsucker early on the morning of May 30 and was too frightened to come to the nest. Her mate waited for her a long time. He finally came out and began a relentless attack, driving her back and forth across the aviary to the point of exhaustion. He then alit on her body and pecked at her head. She only escaped by crawling into a hollow log from which I pulled her some hours later. I removed the sapsucker to give her a respite, and she recovered sufficiently to resume incubation late in the afternoon.

(b) Male destroys eggs.—Both flickers had lost interest by June 5 and were feeding together in the afternoon. After a half hour of quiet activities, the male suddenly went wild. Apparently there was no immediate cause for this explosive behavior consisting of a mixture of high calls, drummings and *we-cup* dances before his mate, interspersed with frantic flying to and fro. She followed him about but remained calm. The male now went to the nest and emerged with an egg which he deposited on the ground. He then carried out three more eggs, all of which oozed blood from punctures and contained embryos. The fifth egg was punctured but not removed. After this episode the pair became as peaceful as before.

#### DISPLAYS AGAINST TERRITORIAL RIVALS

On February 22, 1959, I put the pair of hand-raised flickers into a large cage on the outside of the house. Within a few hours a pair of wild flickers was displaying on the outside of the wire. The yard resounded with high calls and drummings. Both wild birds would fly to the wire with outspread wings and tails displaying the full yellow as male postured opposite male and female against female. This sex alignment was an invariable pattern. The displays continued vigorously throughout the next day in spite of rain and with some lessening of activity for the next three weeks until I returned the captive birds to the aviary. The wild female flicker (WF) was the most persistent. She would run around the edge of the wire, tilting way over in constant *we-cup* and *chewki* dances, following the tame female (TF) wherever the latter moved. TF responded with similar dances. WF sometimes drummed loudly on a tin gutter above the cage or gave high calls from adjacent trees. The wild male

carried on in the same manner as his mate. He was less interested, however, and would fly away after a shorter time. The tame male did not pay much attention to him.

This experiment with an outdoor cage had interest from three points of view: (1) the wild flickers were apparently paired and ready to defend a territory in late winter; (2) in territorial conflicts male displayed against male and female against female; and (3) the displays, vocalizations and drummings used in these conflicts were much the same as those observed during courtship.

### DISCUSSION

The Green Woodpecker (*Picus viridis*) resembles the flicker in feeding on the ground and in having a long protrusible tongue. Blume (1955) made observations on a pair of these birds in May. The male and female communicated with each other over a distance of 500 meters in a "*Rufkorrespondenz*" which continued for a long time, the female calling from the vicinity of the subsequent nest tree. Blume believed that she chose the final site. Thus in the long communication which Blume described for May 1, as in the one which I observed in Florida on April 30, the female was trying to attract the male from his preference for a nest site to hers, or so it appeared, for in each case the female's choice was the one finally accepted.

Woodpecker behavior is open to varied interpretation. Noble (1936:279), after observing and experimenting with a pair of flickers over a few weeks in the breeding season, concluded that the dance of the flickers was "in no sense a method of attracting or stimulating individuals of the opposite sex, but rather a means of defending territory and driving off rivals." This statement represents a limited interpretation. My captive flickers, for example, danced the year around in a complete absence of specific rivals. I have concluded from field and aviary studies that the dance displays, like many of the vocalizations, drummings and tappings made by flickers, are usually made to attract or stimulate individuals of the opposite sex. Flickers, like other woodpeckers, are most expressive in the early breeding season. More studies will be needed before one can fully interpret their behavior.

### SUMMARY

1. The early breeding behavior of flickers has been studied in the field and in an aviary where a hand-raised pair mated and laid fertile eggs.

2. Methods of communication include drumming, tapping, dance displays, wing noise, bill-touching and vocalizations. The last method is categorized into high calls, dance calls, intimate notes and alarm call.

3. Field observations:

(a) Pair formation appeared to take place in mid-winter without reference to a potential nest hole.

(b) A conflict of males at this time was limited to movements of heads and bills, without vocalizations or physical contact.

(c) The most intense displays and vocalizations arose when two females competed for a male. One female attacked the male several times.

(d) In the course of a search for a nest hole in April, a pair of flickers communicated with each other by dances and *we-cup*'s, then by a long distance communication of drums and high calls, and finally, on rejoining, by a duet of drumming. The female's choice of a nest hole was the one accepted by the pair.

(e) Male and female flickers tap in the same manner but not at the same time; the tapping is done in relation to potential nest holes or to ones being excavated.

4. A pair of captive flickers experienced four phases of breeding in which the female evidenced increasing acceptance of the nest box as the male took the lead in arousing her interest. After three failures in which the female's interest collapsed, the box was finally located in a favorable situation and successful mating took place. The interplay of behavior between the two sexes went through the following stages:

(a) Breeding behavior was precipitated when a nest box was placed in the aviary on March 9.

(b) The male was always the first to enter the box in each location, to tap on the outside by the entrance and, later, on the inside. His mate would carry through the same performances after a delay of some days.

(c) The pair danced together, had duets of drumming and occasionally touched bills at this early stage.

(d) As the female began to accept the nest she spent more time clinging to the entrance, made intimate notes and sometimes entered the nest box with the male.

(e) With this increase of interest by the female, the male began to tap out of sight at the bottom of the nest hole and to remove sawdust.

(f) The excavating male might occasionally carry a piece of debris well away from the nest box, then wipe his bill. This behavior followed the pattern of a parent male flying from the nest with a fecal sack.

(g) With continued increase of the female's interest, the male sought coition, but she was unresponsive, initially.

(h) Once the female had accepted the nest box, she invited coition by crouching low on a limb, many times a day. Full coition would follow if the male was ready. Otherwise he might mount and come off in pseudo-coition.

(i) Vocalizations and displays were minimal at this late stage. The female did a good deal of tapping at the bottom of the nest box and she might strike at the male when he came to the entrance.

(j) As soon as the female had laid her first egg, she began to rest in the entrance with her breast feathers puffed out, ready to strike at any intruder.

(k) The male began spending nights in the nest box after the fifth and last egg was laid.

5. Dances and vocalizations associated with territoriality were demonstrated when a pair of wild flickers displayed against the hand-raised pair, which was kept in an outside cage for three weeks.

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